WRITING SAMPLE I:

An Experimental 'Life' for an Experimental Life: Richard Waller's biography of Robert Hooke (1705). In press, British Journal for the History of Science

Abstract:

Richard Waller's 'Life of Dr Robert Hooke', prefixed to his edition of Hooke's Posthumous Works (1705), is an important source for the life of one of the most eminent members of the early Royal Society. It also has the distinction of being one of the earliest biographies of a man of science to be published in English. I argue that it is in fact the first biography to embrace the subject's natural-philosophical work as the centre of his life, and investigate Waller's reasons for adopting this strategy and his struggle with the problem of how to represent an early experimental philosopher in print.

I suggest that Waller eschews the 'Christian Philosopher' tradition of contemporary biography – partly because of the unusually diverse and fragmentary nature of Hooke's intellectual output – and draws instead upon the structure of the Royal Society's archive as a means of organising and understanding Hooke's life. The most quoted phrase from Waller's biography is that Hooke became 'to a crime close and reserved' in later life; this essay argues that Waller's biographical sketch was fashioned so as to undo the effects of that reserve. In modelling his approach very closely on the structure of the Society's records he was principally concerned with making Hooke's work and biography accessible, intelligible, and useful to the Fellowship in a context familiar to them, a context which had provided the institutional framework for most of Hooke's adult life. I argue that Waller's 'life' was also intended to make the largest claims for Hooke's intellectual standing that the author dared in the context of the enmity between Hooke and Newton once the latter became president of the Royal Society. However**,** I also adduce fresh manuscript evidence that Waller actually compiled, though he did not publish, a defence of Hooke's claim to have discovered the inverse square law of gravity, allowing us to glimpse a much more assertive biography of Hooke than the published version.

i) Early Modern biographies of men of science

A scholar wishing to approach the subject of scientific biography in late seventeenth- and early eighteenth-century England faces several problems. In the first place, well-rehearsed objections, from intellectual historians and literary critics, may be raised to the use of the words 'scientific' and 'biography'.[1] The latter term was not much in use in its modern sense, and the former not at all. These objections are a salutary warning against anachronism, and against distorting presuppositions of conceptual and generic coherence. A further and more pressing problem is that the scholar will find few examples on which to work; even if we allow the modern terms to stand, there is very little writing in the period between the death of Francis Bacon in 1626 and the beginning of the eighteenth century that meets the definition of scientific biography.[2] Yet the period was characterized by an explosion of life-writing, as well as of experimental natural philosophy (productive of enough real progress in the natural sciences to be retroactively celebrated as the 'Scientific Revolution').[3] Why was this growth of natural philosophy, as a pursuit, as a written discourse, and (to borrow a seminal phrase) as a 'form of life', not reflected in the biographical explosion of the seventeenth century?[4]

The dearth of biographical treatments of theorists and practitioners of natural philosophy in seventeenth-century England is indisputable, notwithstanding the variety of

[1] On early modern biography, see Adam Smyth, Autobiography in Early Modern England, Oxford: Oxford University Press, 2010; Allan Pritchard, English Biography in the Seventeenth Century: A Critical Survey, Buffalo: University of Toronto Press; Kevin Sharpe and Steven Zwicker (eds.), Writing Lives: Biography and Textuality, Identity and Representation, Oxford: Oxford University Press, 2008. OED's first recorded use of 'biography' is in Dryden's Essay of Dramatick Poesy (1683), though 'biographia' is acknowledged as a precursor. The conceptual anachronism of 'science' as a category of early modern life and thought has long since been accepted as a commonplace by historians, although some continue to use the term for convenience; see for example Michael Hunter, Establishing the New Science, Woodbridge: Boydell Press, 1989.

[2] Even in the eighteenth century the scarcity of scientific biographies is remarkable: see A. Rupert Hall, Isaac Newton: Eighteenth-century Perspectives, Oxford: Oxford University Press, 1999, pp.10-11 for a short overview.

[3] Pritchard, English Biography pp.10-12.

[4] Steven Shapin and Simon Schaffer, Leviathan and the Air-pump: Hobbes, Boyle and the Experimental Life, Princeton: Princeton University Press, 1985, p. 341.

biographical forms then current (including prefatory lives and funeral sermons as well as separately printed lives, collections of lives, and biographical dictionaries.) To be more specific, there are only half a dozen lives printed of prominent seventeenth-century natural philosophers up to 1705: William Rawley's life of Francis Bacon, attached to the Resuscitatio of 1657; William Lloyd's funeral sermon for John Wilkins (1672); Abraham Hill's life of Isaac Barrow (1684); some of the sketches in Anthony Wood's collection of lives of notable authors and divines from the University of Oxford (1691-2); Gilbert Burnet's funeral sermon for Robert Boyle, reprinted several times; and Walter Pope's idiosyncratic memoir of Seth Ward (1696).[5] None of these authors, with the qualified exception of Anthony Wood, treat their subjects' work in the natural sciences as a principal claim to distinction; to the extent that these lives are held up as exemplary, the activities of their subjects as natural philosophers, scientific administrators, and advocates for the new learning are either left out or very briefly handled. With few exceptions, as Richard Yeo points out, this tendency is also manifest in the early eighteenth-century biographical dictionary entries on men of science:

> However, most entries on scientific figures [in Biographia Britannica] – such as those on Barrow, Bentley, Derham, Maclaurin, Ray – mention their scientific works but give no extensive summary of these, of developments in their thought, or of any

[5] William Rawley, 'The Life of the Honourable Author' in Resuscitatio, or brining into publick light severall pieces, of the works civil, historical, philosophical & theological...of the Right Honourable Francis Bacon London: Sara Griffin for William Lee, 1657, sig. b2r-B3r ; William Lloyd, A sermon preached at the funeral of the Right Reverend Father in God, John Late Lord Bishop of Chester London: Andrew Clarke or Henry Brome, 1672, and repr. five times to 1704; Abraham Hill, 'Some account of the life of Dr Isaac Barrow', in *The works of the learned Isaac Barrow ... published by the* Reverend Dr Tillotson, 4 vols. (1683–7), vol. 1, pp. iv–ix; Anthony Wood, Athenae Oxonienses, 2 vols, London: 1691-2, especially pages 370-72 (John Wilkins), 610-11 (William Petty), 627-9 (Seth Ward), and 642-3 (Theodore Haak); Gilbert Burnet, A Sermon preached at the funeral of the Honourable Robert Boyle, London, 1692; repr. 1692, 1704; and Walter Pope, The Life of the right Reverend Father in God Seth, Lord Bishop of Salisbury, London, 1697.

debates in which they were involved. Instead, the evaluative emphasis centres on their character, with most being seen as examples of the 'Christian Philosopher'.[6]

It is significant in this respect that Allan Pritchard, who selects Hill and Rawley as his exemplary scientific biographers in seventeenth-century England, insists that Rawley 'concerns himself primarily with [Bacon's] powers of mind, his originality as a thinker' and that Hill 'gives special emphasis to [Barrow's] important work in mathematics and other secular fields'.[7] These can only be said to register as emphases if we were expecting them not to feature at all; it would be fairer to say that the subjects' work in secular fields is not passed over in total silence. The idea of putting a natural philosopher's work at the centre of his written life was unusual enough in the seventeenth century that it was scarcely expected to happen.

From the point of view of contemporary biographical practice the problem of properly situating subjects engaged in research into nature is linked to the university and the hierarchy of academic disciplines. Virtually all the above examples use the university, or an ecclesiastical or academic career, as a controlling outline for the biography. Wood's Athenae Oxonienses deals with writers and divines educated at Oxford. The separate biographies Wilkins and Ward view them through their careers in the church (and, in Wilkins' case, his tenures as a college head in Oxford and Cambridge). Rawley, meanwhile, structures his life of Bacon around his subject's legal and political career. This approach fits into established patterns of early modern biographies of learned men, where the individual's claim to noteworthy or exemplary status was a function of his eminence in one of the three higher

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[6] Yeo, 'Alphabetical Lives: Scientific biography in historical Dictionaries and Encyclopaedias' in Michael Shortland and Richard Yeo (eds.), Telling Lives in Science: Essays on Scientific Biography, Cambridge: Cambridge University Press, 1996, pp. 148-9.
[7] Pritchard, English Biography, pp. 118 and 120.

academic disciplines: medicine, theology or law. Faculty hierarchy was also the organizing principle for the obvious Continental antecedents to Wood's Oxford directory – such as Melchior Adam's collection of lives of medical men in the German lands.[8] Where such a principle was lacking – as was the case with natural philosophy, whose official standing within the early modern university was ambiguous at best – it became necessary for biographers to look beyond the established norms for new models of life-writing.

One such instance, and also the pre-eminent example of early modern English scientific biography, is John Aubrey's collection of biographical sketches, published in the nineteenth century as Brief Lives. These are a separate and complex case and call for brief discussion here. Aubrey (1626-1697) was well-connected in English scholarly circles and his biographical notes includes a wealth of material on the early Royal Society and seventeenth-century natural philosophers. Apparently begun at the urging of Anthony Wood, for whom Aubrey had previously worked in gathering material for Athenae Oxonienses, none of this material was published in Aubrey's lifetime. The closest he came was his apparatus for a set of lives of English mathematical writers, but even that fell down at the planning stage. Brief Lives is ample evidence in and of itself that Aubrey regarded the intellectual endeavours of men of science as an important claim to distinction. Yet the frequently undigested nature of the material, the emphasis upon personalities rather than exemplary types and on the intimate, gossipy detail drawn from anecdote or personal knowledge, which are precisely why historians have valued Aubrey as a source and literary scholars as a stylistic and genre innovator, also make it very difficult to treat him as an antecedent for Waller. The problems Waller faced, of narrowing focus, of selecting and organizing material for public consumption in order to create a stable

[8] Melchior Adam, Vitae Medicorum Germanorum (Heidelberg, 1620). Hooke apparently owned a copy of this work, since it was sold in the auction of his library. See William Poole, 'Antoine-François Payen, the 1666 Selenelion, and a rediscovered letter to Robert Hooke', Notes and Records of the Royal Society 61 (2007), 251-63, 257.

public identity for the natural philosopher in print, simply do not arise for Aubrey in the same way.

Of the early subjects of scientific biography or early scientific biographers, Ward, Boyle, Hill, Wilkins and Pope were all closely associated with the Royal Society. The Society rapidly became crucial to the visibility and prestige of natural philosophy in Europe, and began to attract letters and poems of praise, petitions to be admitted among its membership, dedications of philosophical works, gifts of books or natural rarities or (rather less frequently) money, and imitators. It also began to attract criticisms and lampoons, and to produce apologia on its own behalf.[9] Its secretary, Henry Oldenburg, produced from its activity and his immense correspondence with scholars and natural philosophers in Europe the world's first learned journal, the Philosophical Transactions. Much of the textual production associated with the early Royal Society displays an urgent sense of how vital the intellectual and social prestige of its members and associates could be to its own standing, and these were played up at every opportunity; its status as a royal foundation was trumpeted, its membership lists published, and the talents, inventions and discoveries of its members reinforced in print.[10] Yet there were no attempts to enlist the posthumous reputations of prominent members to its own benefit. Short biographies of prominent early Fellows appear in the transcripts of the Society's meetings printed by Thomas Birch in the 1750s, but these are his interpolations and the archival record shows no evidence of this kind of commemoration. In the published transcripts they appear as

[9] The best known of the apologia are Joseph Glanvill, Plus Ultra, London: 1668, and Thomas Sprat, The History of the Royal Society, London: 1667; of the attacks, Henry Stubbe wrote several, including Legends no histories; a specimen of some animadversions upon the History of the Royal Society, London 1670; and Thomas Shadwell's play of 1676, The Virtuoso, mocked the Fellows of the Society in the person of Sir Nicholas Gimcrack.

[10] See Sprat, History, passim; the Society membership lists began to be published as early as 1663 (a surviving example exists in RS Tracts 1/2), while Oldenburg's Philosophical Transactions reviewed, previewed and promoted Boyle's work in particular to an astonishing extent; almost 25% of the first volume of the journal is by Boyle or about him, amounting to over 90 quarto pages out of 400.

sketches in the accounts of the anniversary meeting of the Society, held on the 30th of November, of the year in which the Fellow died; Birch was plainly concerned to incorporate his accounts of their lives into some broader notion of institutional commemorative practices.[11] Birch also produced numerous entries for the General Dictionary Historical and Critical (1731-1740) – over 500, according to James Marshall Osborn – including those for Newton and Hooke.[12] It is also worth remarking that Louis XIVs pensionary Académie Royale des Sciences, in Paris, inaugurated a tradition of speaking elegies for its dead members that would subsequently be printed in the official records, a tradition formally enshrined in the Académie's practices by the reforms of 1699.[13] There was no English equivalent. The first issue of the Philosophical Transactions contained an obituary notice of Pierre de Fermat, lifted verbatim and without attribution from a recent number of the Journal des Sçavans, although this was anomalous.[14] Even in Oldenburg's journal, however, which was strongly predicated on the notion of community among natural philosophers and which worked hard to establish and extend that community and Oldenburg's importance within it, publishing obituaries never became standard practice during the seventeenth century. Even when Oldenburg died and the editorship of the journal passed to Nehemiah Grew, the fact went poignantly unrecorded.[15]

[11] To take just four examples among the prominent early fellows, Birch added short biographical notes of John Beale, Robert Moray, John Collins and John Wilkins, all of whose deaths went unremarked in the records of the Society. Thomas Birch, A History of the Royal Society, 4 vols. London: 1756-7, vol. III pp. 67-8 (Wilkins), 113-4 (Moray) and vol. IV 232-4 (Collins) and 235 (Beale).

[12] James Marshall Osborn, 'Thomas Birch and the General Dictionary', Modern Philology (1938) 36, pp. 25-46, pp. 37, 39.

[13] For accounts of the éloges see Stephen Gaukroger, 'The Académie des Sciences and the Republic of Letters: Fontenelle's Role in the Shaping of a New Natural-Philosophical Persona, 1699-1734', Intellectual History Review, (2008) 18, 385-402; and the book-length treatment given by Charles B. Paul, Science and Immortality: the Eloges of the Paris Academy of Sciences (1699-1791), Berkeley: University of California Press, 1980.

[14] 'The Character, lately published beyond the seas, of an Eminent Person, not long since dead at Tholouse', Philosophical Transactions (1665) 1, pp.15-6.

[15] Philosophical Transactions number 136 (volume 12, 1677-8) was the last issue printed by Oldenburg;

The first biography of a natural philosopher to be published in English that actually gave substantial space and consideration to his work in the sciences was the 'Life of Dr Robert Hooke', prefixed by Richard Waller to his 1705 edition of Hooke's Posthumous Works.[16] Waller went further than this, however; more than acknowledging or emphasizing the significance of Hooke's work, he made it the binding thread of Hooke's life. Twentieth-century scholars of the history of science who have made use of Waller's 'Life' (and eighteenth-century compilers of biographical dictionaries, who frequently reproduced not just Waller's information but his language) have tended to deploy it as a counter in the controversies between Hooke and Isaac Newton over light and gravity, a context that has continued to overshadow its other significance. (The distorting effect of that context can perhaps be conveyed by remarking that Waller has been variously accused by Hooke's biographers of craven betrayal or unfair severity toward him, and weak-minded partiality and credulousness in his favour. Seen in that light, Waller's own attempt at impartiality, or at any rate studied neutrality, ironically falls victim to the tendency of the Hooke-Newton quarrels to make partisans of so many of their more recent biographers.)[17]

Perhaps because of these tendencies, the originality of Waller's approach to setting out Hooke's life has been missed. In addition to suggesting that the emphasis of subsequent scholarship on Newton has led to the consistent misinterpretation of Waller's biography, this essay will produce fresh manuscript evidence concerning Waller's interest in the Hooke-Newton controversies. I argue that Waller confronted three problems in writing his biography. First, there was the problem engendered by the breakdown of the working relationship between

[16] Waller, 'The Life of Dr Robert Hooke', in Richard Waller (ed.), The Posthumous Works of Dr Robert Hooke, London: Samuel Smith and Benjamin Walford, 1705. Hereafter 'Life' and Posthumous Works, respectively.

[17] See Frank Manuel, A Portrait of Isaac Newton, Cambridge, MA: Harvard University Press, 1968, p. 136; and Margaret 'Espinasse, Robert Hooke, London, 1955 p. 8; Lisa Jardine, The Curious Life of Robert Hooke, London: Harper Perennial, 2003 pp. 4-15, 320.

Hooke and Henry Oldenburg in 1675, and the Royal Society's consequent deprivation of the work of its most fertile experimenter.[18] Second, there was the problem of explaining a career that was difficult to translate into familiar frames of cultural reference, as well as being (even from the perspective of the natural philosophical community) perplexingly diffuse. Third, there was the problem of framing Hooke creditably under the gaze of a hostile President of the Society.

ii) The Hooke Problem

Hooke's biographers down to the present, whether they have been concerned to vindicate or to blame him, have been united in sensing a thwarted life, extending even to the fate of his papers and possessions after his death. Hooke died intestate and his papers passed to living relatives with whom he had never had much to do. Lisa Jardine has pointed to a draft will showing Hooke's intention of leaving his goods to four unnamed friends, and endowing a lectureship at the Royal Society or providing it with a laboratory.[19] The will was never witnessed, however, and the papers from which Waller produced Hooke's biography, like most of his literary remains, have had a complicated existence. Hooke's diaries, one of the most important sources for the social world of early modern science in Britain, have emerged piecemeal and been edited separately, the last fragments of them appearing in print only in 2007.[20] In the twenty-five years after his death, his papers passed through the hands of two literary executors, and two distinct volumes of his posthumous works were produced, in 1705 and 1726 respectively. Both those executors — Waller initially, and later William Derham — complained of the piecemeal fashion in which they received his papers, and of the disorder

[18] Good accounts of this are given in Adrian Johns, The Nature of the Book: Print and Knowledge in the Making, Chicago: University of Chicago Press, 1998, pp. 521-34 and Rob Iliffe, '"In the Warehouse": Privacy, Property & Priority in the Early Royal Society', History of Science (1992) 30, pp. 29-68.
[19] The Curious Life of Robert Hooke, p. 315
[20] Felicity Henderson, 'Unpublished material from the memorandum book of Robert Hooke, Guildhall Library MS 1758', Notes and Records of the Royal Society (2007) 61, pp. 129-175.

among the papers themselves.[21] This sense of a fragmentary life is frequently pointed to by Hooke scholars as sadly typical of a career full of accomplishments as an engineer, chemist, mathematician, astronomer, instrument-designer, geologist, microscopist, horologist and physicist – besides his more lucrative sidelines as a surveyor and architect – whose subsequent estimation was (to an important extent) undermined by the very versatility which had characterized it. This is to say nothing of Hooke's unhappy and often-remarked knack of engendering lifelong resentments in colleagues as eminent as Newton, Christiaan Huygens, and John Flamsteed.[22] In fact the damage done to Hooke's reputation in the early eighteenth century was such that it was only in the late twentieth and early twenty-first centuries that serious attempts were made to rehabilitate Hooke and his scientific achievement.

The sense that Hooke might have failed to do himself justice in his lifetime was one that Hooke himself apparently expressed. The following, richly suggestive words are taken from a manuscript diary, now lost, but in 1705 apparently in Waller's possession:

> "Saturday April the 10th 1697. I began this day to write the History of my own Life, wherein I will comprize as many remarkable Passages, as I can now remember or collect out of such memorials as I have kept in Writing, or are in the Registers of the Royal Society; together with all my Inventions,

[21] Waller, 'The Publisher to the Reader' in Hooke, Posthumous Works sig. A2v; and Derham, *Philosophical Observations and Experiments of […] Dr Robert Hooke* (London, 1726), especially the 'Preface'.

[22] This judgement is such a commonplace as to be embedded in the title of one of Hooke's most recent biographies, Stephen Inwood's The Man Who Knew Too Much; The Strange and Inventive Life of Robert Hooke. See also the editors' introductions to two collections of anniversary essays on Hooke, in Michael Cooper and Michael Hunter (eds.), Robert Hooke: Tercentennial Studies, Aldershot: Ashgate, 2006, esp. pp. xiii-xviii and in Michael Hunter and Simon Schaffer (eds.), Robert Hooke: New Studies, Woodbridge: Boydell Press, 1989, especially pp. 1-2, which point to versions of this view across three centuries in the Biographia Britannica, in an 1880 article in the Edinburgh Review, and in the Dictionary of Scientific Biography.

> Experiments, Discoveries, Discourses &c. which I have made, the time when, the manner how, and the means by which, with the success and effect of them, together with the state of my Health, my Employments and Studies, my good or bad Fortune, my Friends and Enemies, &c. all which shall be the truth of Matter of fact, so far as I can be inform'd by my Memorials or my own Memory, which Rule I resolve not to transgress."[23]

There are a number of points to tease out here: the sense of life-writing as a system of personal accounting implied in the records of Hooke's good and bad fortune, his friends and enemies; the life consisting of a catalogue of mechanical and philosophical discoveries. Above all, there is the suggestion that Hooke and the Society could be so closely identified with one another that the institution's and the individual's memory overlap to the extent that neither is complete without the other. (That overlap had a very literal manifestation in the late 1690s, when Nehemiah Grew petitioned the Royal Society for a testimonial to the effect that he had presented to the Royal Society on mineral waters many years previously; when nobody else could find anything about it, Hooke, 'being the only person who remembered the matter signed such a testimoniall as he himself wrote from his memory'.)[24] Yet the tone Hooke sets for his narrative is one of self- vindication; he aims to record the times and places of particular discoveries in order to fix his own claims to priority. More broadly, this note points to a problem that confronted Hooke throughout his professional life, namely the extent to which his close identification with the Royal Society represented a desirable or troublesome state of affairs.

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[23] Waller, 'Life of Hooke', p. i.

[24] Royal Society JBO X p.26, April 29 1697. For a more detailed account, and for the context that elicited Hooke's testimonial, see Adrian Johns, Piracy: The Intellectual Property Wars from Gutenberg to Gates, Chicago: Chicago University Press, 2010, p. 96

Of the early Fellows of the Royal Society, Hooke was among those most intimately associated with it. He was at different times an employee, a Fellow, a member of its governing Council, and one of its honorary officers. He and it occupied the same building, if not precisely the same quarters, for almost thirty years, and he was indispensable to the experimental vigour of the Society's early years. Hooke had lived since 1664 in Gresham College, where the Society held its meetings (but for a seven-year interlude while the Society, though not Hooke, was displaced by the Great Fire). When he died, in March 1703, his death wasn't simply an intellectual loss to the Society — he had been too physically debilitated to take an active role in the Fellows' discussions during the last couple of years of his life — but threatened the integrity of the Society's archives and collections. The Society itself was even threatened with physical expulsion from its home of forty years. Within three weeks of Hooke's death the Gresham trustees had asked for his keys back and demanded that the Society remove itself and its rather disordered collections.[25]

There has been substantial recent work on the construction and reformation of philosophical identities in the seventeenth century.[26] Similar work on seventeenth-century biography shows that the lives of early modern notables were frequently written with the aim of co-opting an admired figure to a particular intellectual, political, or religious agenda, or of holding him up as an example to be emulated (usually in the matter of Christian conduct.)[27] In such contexts, a person's professional accomplishments or intellectual biography were quite

[25] Royal Society JBO XI pp.14, 16. The Society was eventually granted a stay of its expulsion but moved out to new premises in Crane Court in 1710. See Jim Bennett, 'Wren's last building', Notes and Records of the Royal Society 27 (1972-3), 107-118.
[26] See for example among the book-length studies Shapin and Schaffer, Leviathan and the Air-pump; Shapin, A Social History of Truth; and Stephen Gaukroger, The Emergence of a Scientific Culture, Oxford: Oxford University Press, 2008.
[27] On the exemplary lives tradition, see Pritchard, English Biography, pp. 31-48

often only considered in passing. The lives of scientific men in the period are therefore distorted both by the lack of any necessary expectation that their professional lives would be recorded in detail, and by the problematic extent to which the natural philosopher enjoyed a culturally coherent identity. (He was certainly recognisable enough to be a subject of ridicule on the public stage -—witness Sir Nicholas Gimcrack, the Hooke-Boyle composite who was the title character of Thomas Shadwell's The Virtuoso (1676) —but mockery, as John Dryden pointedly reminded Shadwell, does not necessarily imply subtle understanding).[28] That Hooke and Boyle were the figures most ripe for caricature in the Royal Society is significant. Boyle was probably the Fellow whose membership brought the Society most prestige during its first thirty years of existence and Hooke was among the most physically visible. Between his activity in Christopher Wren's architectural practice and his work as a City Surveyor, staking out the boundaries of houses for thousands of Londoners in the years after the fire of 1666, his twice-daily visits to the coffee-house, energetic walks around London, and his not infrequent conducting of experiments in public view, Hooke was ubiquitous.[29] To fuse Hooke and Boyle as Shadwell did, however, was to miss any sense that Hooke and Boyle had significantly different relationships to the Royal Society from one another, and significantly different social positions, even if both men were recognizable as natural philosophers.

Waller had various explanations of his subject available to him, which would be differently intelligible to different audiences (and which, it should be noted, would reflect more

[28] Dryden, Mac Flecknoe; or, a satyr upon the trew-blue protestant poet, T.S,, London, 1682, p.12. Mac Flecknoe was written in 1676, the same year as Shadwell's play was performed; the lines "Where did his wit on learning fix a brand/Or rail at arts he did not understand?" are usually taken to refer to Shadwell's satire on the Royal Society, of which Dryden was an early if wholly inactive member.

[29] For Hooke's social life, see Jardine, The Curious Life of Robert Hooke, pp. 110-11 and 272-80; Mordechai Feingold, 'Robert Hooke: Gentleman of Science', in Cooper and Hunter, Robert Hooke: Tercentennial Studies p.206; and H. Robinson and W. Adams (eds.), The Diary of Robert Hooke 1672-1680, London: 1935, passim. For public experimentation, see Markman Ellis, The Coffee House: A Cultural History, London: Weidenfeld & Nicholson, 2004 pp. 86-7 and 156-60.

or less truthfully on the man.) I wish to resist the notion that Waller created his biography in order to hold up an exemplary life for a large public; nor am I suggesting that he was attempting an intellectual biography in the modern sense. Michael Hunter has highlighted some of the problems that dogged late seventeenth- and early eighteenth-century attempts at producing intellectual biographies of scientists, using Robert Boyle as his example and drawing particular attention to the risk of underplaying the importance of controversy in fashioning new knowledge and the related problem of the contemporary state of knowledge threatening to render obsolete the subject's contribution to it. (Hunter also points to the important antecedent for such attempts in the realm of seventeenth-century learning, Pierre Gassendi's life of Nicolas-Claude Fabri de Peiresc, and his justification of 'writing the life of an intellectual as opposed to a man of action.')[30] Rather, I am suggesting that Waller fashioned the 'Life' as a narrowly circumscribed account intended for people who already knew Hooke and his work reasonably well, and that the originality of Waller's approach, which consisted in relying entirely on Hooke's scientific work to validate his life, had two main aims. First, Waller wrote about Hooke's work in order to make it intelligible and accessible to the Fellowship of the Royal Society, who had helped to sponsor it in the first place and from whom it had latterly been withheld. Second, Waller aimed to make the best possible case for Hooke's intellectual standing in an environment dominated by his great rival, Isaac Newton. In arguing that Waller's biography represents the first effort in English to give pride of place to a scientist's work in the account of his life, I am not arguing for it to be considered foundational but inquiring into what this experimental 'Life' aimed at and what the specific context was that brought it about.

iii) <u>The Newton Problem</u>

[30] Hunter, 'Robert Boyle and the dilemma of biography' in Shortland & Yeo, Telling Lives in Science, pp. 126-8 and 117. Gassendi's work was translated into English by William Rand in 1657.

Careful study of the context from which Waller's text emerged is the more necessary, given that it was subsequently appropriated by eighteenth-century biographers as the basis of a simultaneous undermining of Hooke's posthumous reputation and the elevation of Newton's. John Ward, in Lives of the Gresham Professors (1740) and Thomas Birch in the General Dictionary Historical and Critical (1734-1741) reproduced much of Waller's text and added some new material without editorialising or dissenting significantly from Waller's tone. The compiler of his entry in Biographia Britannica (1747-66), however, while relying straightforwardly on Waller's account (as well as quite a lot of his language) for the facts of Hooke's life, added a commentary that represented Hooke as an underachieving braggart, more or less explicitly accusing him of being an inveterate liar and thief in matters of intellectual property. The author of the Biographia account implies that Waller has been naive to take Hooke's account of himself at face value:

> Our author tells us that in 1658, or the following year, he contrived and perfected the air pump for Mr Boyle, as it was printed in 1660, having first seen a contrivance to that purpose made for that excellent person by Mr Gratorix (or Greatrix), which was too gross to perform any great matter. Mr Hooke here assumes the honour of perfecting that celebrated machine to himself. The sequel of this memoir, will discover the exact weight of that authority as to such claims. In the mean time 'tis certain, that he made a draught of the air-pump as then published by Mr Boyle. This draught was in the hands of Mr Waller, whom he informed, that Mr Boyle sent him then to London to get the barrel and other parts of that engine made there, which could not be done at Oxford.[31]

[31] See "Robert Hooke", in Biographia Britannica III p.2652, Note E.

'The sequel of this memoir' is Hooke's pressing his claim to priority in the matter of the inverse square law of gravitation against Newton in 1686, and the lasting damage it did Hooke's reputation is evident. This claim became the cornerstone of a presumption of bad faith against him, and undermined any priority claim of his, whether it was advanced before or after the clashes with Newton. Hooke's claims to the design of the air-pump used in Boyle's experiments are recast as an illegitimate appropriation of credit from both the man who commissioned it (Boyle) and the man who built it (Ralph Greatorex), and his own involvement reduced below either to the level of a draughtsman and errand-boy.[32] It is worth noting in passing that this attack also has a social dimension – Hooke's pretensions to sharing credit with the aristocratic Boyle are undermined by his unwillingness to give the instrument-maker his due, and his claim to be considered a legitimate philosopher by the social scope of his intellectual avarice, stealing from noblemen and tradesmen alike. Waller unwittingly supplied the raw material for the character assassination, but it needed the addition of extensive glossing and insinuation from the Britannica biographer to blacken Hooke effectively.

The efficiency of the hatchet job in the Biographia Britannica lies precisely in its intertwining of the personal and the professional; Hooke's personal defects are invoked as aspects of his professional derelictions, and vice versa. That circularity is built into the notable lines of attack – Hooke's challenge to Newton is adduced as the ultimate proof of Hooke's bad character, while his bad character has to be established in order to undermine the challenge. (It should be noted that the author of Hooke's entry – a Dr Philip Nichols – also wrote Newton's

[32] That this practice began with the Biographia is easily proved by reference to two earlier biographies, both of which appeared some years after Newton's death and which made extensive, often verbatim use of Waller's 'Life'. The General Dictionary (1734) and John Ward's Lives of the Gresham Professors (1740) both produced accounts of Hooke whose narrative was identical with the *Biographia's* in every important respect but which made no effort to blacken Hooke's character or belittle his achievements.

entry, though too little biographical information about Nichols survives to account for his apparent partisanship.) The attack is not just on Hooke's standing as an experimental philosopher, but on his right to the title of philosopher at all. (He is referred to as 'an eminent mechanic genius' in the first line of the Biographia portrait, where Newton is apparently thought to require no introduction; Waller, by contrast, calls Hooke a 'diligent Inquirer into Nature', and 'one of the greatest Promoters of Experimental Natural Knowledge, as well as Ornaments of the last Century (so fruitful of great Genii).'[33] Nichols's reframing of Waller's phrase is a crucial distinction, between a talented technician with an inventive turn of mind, and one of the leading lights of a revolution in learning that was aware of its own extraordinary fertility. (The same distinction is built, in reverse, into Hooke's praise of Christopher Wren in the preface to Micrographia, which holds Wren up as exemplary for uniting 'such a mechanical hand, and so philosophical a mind.')[34] Both elements were necessary in Hooke's construction of the natural philosopher, and it is this that may perhaps help to explain some of the pattern of Waller's 'Life'.

Hooke was not the only person with whom Newton quarrelled to be profiled in the Biographia Britannica, but he is the only one who attracts particular odium because of it. The handling of John Flamsteed's entry, for example, stands in stark contrast. Flamsteed clashed with Newton over the release of astronomical data from the Greenwich Observatory, but his entry in Biographia is a virtual whitewash, despite the fact that the argument was in some respects more public, drawn-out and vitriolic than Newton's quarrel with Hooke.[35] Hooke's

[33] Waller, 'Life', p. i.
[34] Hooke, Micrographia; or, Some Physiological Descriptions of Minute Beings. London: John Martyn and James Allestree, 1665, sig. g2r-v.
[35] Based on Andrew Kippis's attribution in the preface to the second edition, Flamsteed's entry – signed 'E' – was by Dr John Campbell, one of Biographia's principal compilers – noted by subsequent critics for a tendency to gloss over his subjects' defects (J. Aikin et al., General biography, or, Lives, critical and historical of the most eminent persons, 10 vols. (1799–1815), vol. 2, pp. 448–50).

greater vulnerability to the attacks of Newton's hagiographers stems both from the nature of the quarrel – Hooke had sought to claim as his own discovery the chief pillar of Newton's philosophical reputation, where Flamsteed had only presumed to rebuke him and thwart his wishes – and from the fact that, unlike Flamsteed's, Hooke's career was not crowned with a notable, capital achievement.[36] Waller was certainly aware of this and acknowledges as much in the 'Life' when he admits that Hooke did not always bring his inventions, discoveries and intuitions to 'that perfection of which they were capable'. He pondered: 'whether this mistake arose from the multiplicity of his Business which did not allow him sufficient time, or from the fertility of his invention which hurried him on...I do not know'.[37]

With Hooke as his subject, Waller held in his hands was the stuff of an energetic and productive life, which was nevertheless difficult to fashion either into a recognisable professional identity or into a conventional moral example. His stated purpose in producing the biography was to provide some details of Hooke's life for the curious, at the particular request of some of Hooke's friends. Whether there was really much curiosity about the facts of Hooke's early life is a matter for speculation; for all that he became intellectually secretive (or, more precisely, uncommunicative of his own projects and discoveries) later in his career, he continued to play a prominent part in discussions at Royal Society meetings and remained a fixture at a number of London coffee-houses that were also frequented by Fellows of the Society into the last years of his life. Newton's famous accusation that his rival was of 'a strange unsociable temper' has been effectively dismantled by recent Hooke scholarship;

[36] The Historia Coelestis Britannica, London: 1729. Eventually published by Flamsteed's widow and assistants in 1729, this was a capital work, and it continued in use into the nineteenth century. See Johns, The Nature of the Book pp. 617-21, and pp. 543-621 for a full account of the Flamsteed-Newton dispute.

[37] Waller, 'Life', p. vii (in the context of Waller's account of Hooke's dispute with Huygens over the invention of balance-spring watches and the improvement of timekeepers generally).

Hooke was a visible, social, well-known figure.[38] There was, however, some curiosity about what his work amounted to; Abraham Sharp wrote to Flamsteed a few days after Hooke's death wondering about this, and expressing the hope that Hooke's papers would revert to the Society.[39]

The questions of who Waller's 'life' was to enlighten about Hooke's career, and how it was to do so, are related to a more general one: what was the market for works of speculative natural and experimental philosophy in the late seventeenth and early eighteenth century? Given the shortage of evidence on this point it is necessary to proceed cautiously. These works were often expensive to produce and the print runs usually modest, of the order of 300-750 copies in the cases of which we know.[40] Often the only useful indicator of a work's success is whether it went into multiple editions; relatively few large quartos or folios of this nature did. Furthermore, the lapse of time between a first and a second edition is not necessarily a reliable indication of demand. As is well known from John Wallis's correspondence, it is likely that Newton's Principia had sold out by the mid-1690s, since a second edition was then being contemplated and urged by his colleagues; but it did not actually appear until 1713, almost twenty years later.[41] While it is too much to assume that the Fellowship and the reading public for works of natural philosophy were coextensive, they certainly overlapped to a large degree;

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[38] See note 28, above.

[39] Sharp to Flamsteed, 30 March 1703, in Eric Forbes, Leslie Murdin and Frances Willmoth, eds., The Correspondence of John Flamsteed, the first Astronomer Royal, 3 vols., London: Institute of Physics Publishing, 1995-2001, Vol. 2, pp. 1008-9

[40] Among well-known editions in the history of science, this is the range Alan Cook allows for the first edition of Newton's Principia, while Sachiko Kusukawa points to Francis Willughby and John Ray's Historia Piscium (1686), which had a print run of 500. Cook, Edmond Halley: Charting the Heavens and the Seas, Oxford, Oxford University Press, 1998, p. 155; Kusukawa, 'The Historia Piscium (1686)', Notes and Records of the Royal Society 54 (2), 2000, pp.179-197 p. 191

[41] See Wallis's letters to Newton and Waller, both 30 April 1695: H.W. Turnbull et al. (eds.), The Correspondence of Isaac Newton, 7 vols., Cambridge: Cambridge University Press, 1959-1975, 4 pp.116-7 and RS EL/W2/49 & 50.

the Fellowship stood at around 250 in 1700, a market theoretically big enough by itself to make an edition of 500 to 750 copies financially viable, if not actually profitable. Books published by Fellows of the Society thus had a large part of their natural market directly to hand. The Continental market for vernacular English publication was mostly too small to be significant, since few European scholars outside the British Isles could read English; even 80 years later, Augustin Mann reckoned that half a dozen offprints of an article of his in the Philosophical Transactions would be all that he needed to furnish his English-speaking acquaintance on the Continent with copies.[42]

Waller's volume was associated with the Royal Society wherever one chooses to look. It was an edition of papers by the Society's first in-house experimenter, mostly carried out under its aegis, compiled and edited by its current Secretary, and dedicated to the Society. But it was also the case that Hooke had to an unusual extent withdrawn himself from the Society's usual practices of registration and publication of experiments, by failing to leave copies of his reports in the Society archives. Furthermore, the Society had some proprietary claim on at least a part of his work, since a good deal of it had been carried out while he was a Society employee. When Nehemiah Grew read some lectures at the Royal Society in December 1677, for instance, the fact that the Royal Society had sponsored his lectures apparently made them feel they had some say over the proper way to publish them.[43] Hooke's withdrawal from those practices, following a series of clashes with Henry Oldenburg in print and in person over what Hooke considered was Oldenburg's less than perfect probity in managing the flow of information out

[42] Augustin Mann to Joseph Banks, 31 December 1779, in Neil Chambers (ed.), The Scientific Correspondence of Joseph Banks, 6 vols., London: Pickering & Chatto, 2006, vol. 1 pp. 221-2

[43] When Grew was encouraged to print his lecture John Wallis observed that 'it was proper to print all that kind in quarto, that they might be bound together.' Birch, History, vol.3 pp. 359-60. Wallis probably refers here to Grew's previous sponsored lectures; for an account of these and the Society's sponsorship of them, see Michael Hunter, 'Early Problems in Professionalizing Scientific Research: Nehemiah Grew (1641-1712)', Notes and Records of the Royal society of London, (1982) 36, pp.189-209.

of the Society and maintaining its records, is very well known.[44] Hooke ceased to publish in the Philosophical Transactions, and endeavoured to replace them with his own sporadically appearing journal, the Philosophical Collections (7 issues, 1679-82). After his own Lectiones Cutlerianae (1679) he published no more separate works in his lifetime, bar a few short papers in the revived Transactions under Edmond Halley's editorship (and he continued to campaign against the journal even then).[45] The breach between Hooke and Oldenburg was never repaired and it had lasting repercussions for the subsequent administration of the Society; and, because Hooke had come to distrust the practices of registration of material in the Society's archives, it also left a substantial gap in them.

iv) The Experimental 'Life'

Beyond the habitual consideration that many of the potential buyers of any work of natural philosophy printed in England were fellows of the Society, then, Waller's edition was of particular interest for the members because it could effectively fill a void in the Society's archives. It consisted of work that had not been published by Hooke himself, nor put forward in the Philosophical Transactions, nor even deposited in the Society's archives as it ordinarily should have been.[46] For a brief period following Henry Oldenburg's death Hooke enjoyed the control over the Royal Society's mechanisms of registration and publication that he had long hoped for, and during that time Hooke published two collections of thematically-grouped research – respectively on comets and microscopes, mostly by himself, but some by other Fellows of the Society and its Continental correspondents. This practice of organising research

[44] See Iliffe, 'In the Warehouse', and Johns, The Nature of the Book (n. 17, above).
[45] For Hooke's continuing campaign against the Transactions, see Johns, "Miscellaneous Methods: Authors, Societies and Journals in Early Modern England", British Journal for the History of Science, (2000) 33, pp. 159-86, 172-4.
[46] Hooke occasionally pledged the delivery of fair copies of the experiments and lectures he had delivered to the Society, and a partial account was delivered in 1684. Birch, History IV pp. 319-20. Hooke's contributions are transcribed in Royal Society, Register Book (Original) 6/10 and RBO/6/19. Hooke's manuscripts of these accounts are in the Macclesfield Collection at Cambridge University Library, MS Add. 9597/13/5/130-156.

into thematic tracts is one that Hooke favoured from the early 1670s onwards, but it was also endorsed by the Society in 1678 as a method for publishing systematically-conducted, institutionally guided and sponsored research.[47] The Society had become increasingly concerned about the absence of Hooke's work from their records, badgering him throughout the 1680s to produce written accounts of it and even agreeing in 1696 to fund the repeating and writing up of all the experiments Hooke had carried out for the Society.[48] When Waller came to organise this material and to write Hooke's life, he created a structure for the biography that bore an explicit analogy to the structure of the Society's journal- and register-books, in their brevity, chronological sequence, and juxtaposition of unrelated material. (The intertwining of the Society's manuscript archive with the printed 'Life' is the explicit ground of Waller's omission of material from his biography that was adequately documented in the archive; in particular Hooke's investigations from the early-to-mid-1660s, many of which are documented in the Royal Society's Register-book and the originals gathered in Classified Papers 20).[49] This enables him to evoke the Society itself as an organising principle in Hooke's life and as a guarantee of fidelity for it. The bulk of the 'life' deals with Hooke's maturity, and within that period Hooke's fertility of invention and the piecemeal nature of his scientific productivity can be accounted for and indeed valued in the context of the institution, which was itself set up so as to be able to produce, contain and in theory validate natural knowledge of all kinds, maintaining its coherence in diversity. The interpenetration of Hooke's scientific activity with the Royal Society's amounted to virtual identity at certain times in the institution's early

[47] For a detailed discussion of this, and the complex relationship between institutional publishing and Hooke in particular, see Moxham, 'Fit for print: developing an institutional model of scientific publishing in England, 1665-ca.1714', Notes and Records 69 (2015) 241-60.
[48] See Waller, 'Life' p. xxvi: 'he had a design to repeat the most part of his Experiments, and finish the Accounts, Observations and Deductions from them, and had an Order for the Societies bearing the Charge thereof, in June 1696.'
[49] Waller, 'Life of Hooke' p. ix.

history, and Waller's 'Life', a tissue of materials obtained from Hooke's relatives woven with the Society's journals, recreates that interdependence.

The 'Life' contains nothing presented as anecdote that is not specified as originating in Hooke's writings (or, on just a couple of occasions, in his conversation) and Waller confines personal reflections to his broadly evaluative comments in the last few pages, most of which are primarily concerned with the effects of Hooke's character upon his professional successes and reputation. Barring that, and an initial excursion that gathers all the material Waller could find on Hooke's horological work into one place (pp. iv-vii, the better to deal with the Huygens disputes), the rest is a chronological series of short paragraphs describing Hooke's scientific activity, and it is remarkably precise, with the publication of inventions, discoveries or lectures often being given to the month or even to the day. Much of this material is adapted from the Society's Journal-book (minutes of meetings) or summarises entries in the Register-Books (write-ups of experiments and inventions) – and indeed, quite a lot is given in quotation marks, although there is no reference to the Journals themselves.[50] Waller does not omit Hooke's other professional interests. His work as City Surveyor after the fire of London and his architectural practice are both mentioned. Neither, however, occupies more than a very short paragraph, in other words no more than the dozens of minor papers, inventions and experiments shown to the Royal Society or read under the terms of Hooke's Gresham and Cutler lectureships. This broadly reductionist tendency in the 'Life' serves as a way of valorising Hooke's scientific work in relation to his other activity, and gives it a structure analogous to the records of the Society itself, on which it is partly based. The precision of the dating, the preponderance of natural philosophical activity, and the extensive (if in many cases silent, as outlined above) cross-referencing with Hooke's other published works, the records of the Society, and the

[50] See for example 'Life' p. xxiii, in which Waller quotes a lengthy Journal-Book entry, slightly adapted, on the internal motion of Bodies. The passage is marked as quotation but does not refer to the Journals. See Birch, History III p. 46.

Philosophical Transactions, combine to turn the 'Life' into a sort of finding aid for Hooke's work designed to help unify the published with the unpublished. (Waller in fact had a history of involvement with projects intended to put the Society's stock of accumulated knowledge to easier use: he produced an index to individual volumes of the Society's records, as well as a general index to the entire series in 1690, and translated a number of Continental works that were notably difficult to access in Britain, two of them in collaboration with his brother-in-law Alexander Pitfeild, and at least one of them – the Académie Royale's Mémoires pour server a *l'histoire naturelle des animaux* – apparently at the behest of Hooke himself.)[51] The problems faced by the compiler and editor of Hooke's voluminous remains, discussed in more detail below, are addressed by making them, and the life, intelligible as the institutional product of an institutional creature, a man who had been used 'from his Youth ... to a Collegiate, or rather Monastick Life.'[52]

In using the registers of the Royal Society as source material in this way Waller is not simply following the principles Hooke had laid out for himself, since he does not only cite them for authority – he specifically envisages his work as complementing their function, omitting to give details of a number of Hooke's inventions and experiments on the grounds that from the time of his election as Curator 'the Societies Journals gave sufficient Testimony of his Performances, all which would be too many to particularize here'. 'Therefore', he concluded, 'I shall only touch upon some of the chief'.[53] By this logic the Royal Society's archive becomes the most proper account of Hooke's work, helping to cement the identification between the individual and the institution, while Waller's edition helps to plug a gap in it that

[51] Royal Society Journal Book VIII, p. 295. See also Waller's letter to Hooke, BL Sloane MSS 4067 f.97 (no date, but probably late 1686, prior to the licensing of Pitfeild's translation in the Royal Society's Council in November – see Birch, History IV p. 501.)
[52] Waller, 'Life of Hooke' p. xxvii.
[53] Waller, 'Life of Hooke' p. ix.

the Society had long been concerned to fill. The reference to the archive, a quasi-public but not-quite-published body of material, gives the clearest possible indication of the intended audience for the Posthumous Works. Clearly, and crucially, such an audience must have had access to the Society's archive, since the archive, the 'life', and the Posthumous Works are implied to be interdependent. This audience was, presumably, the Fellows themselves. Whether the edition that Waller produced lived up to the hopes the Royal Society entertained of its contents is not clear, but there can be no doubt that part of its intended function was to reintegrate the work Hooke had carried out partly on the Society's behalf with its own records, and with the published record of research conducted under the Society's aegis.

Hooke's death represented an opportunity in one respect, for the reintegration of his work with the records of the Society, but it was also a threat, as we have noted, to the physical integrity of the Society and its archive, and there is also some evidence that the Society's repository suffered considerable loss and deterioration in the years after Hooke's death.[54] The publication of material Hooke had withheld for so long reflects both the Society's impatience with its inaccessibility and perhaps also a real anxiety about the danger of its dispersal. This was a justified anxiety, as indicated by the twenty-first-century re-emergence of the Hooke Folio – a lost manuscript volume of Hooke's draft minutes from his time as Secretary of the Society and jottings from the Society's records that surfaced in private hands in 2006.[55]

Waller's organisation of the Posthumous Works also amounts to an implicit defence of Hooke's stature and his right to the title of experimental philosopher. (Here, however, we have

[54] For an apt summary, see Jenni Thomas, 'A 'Philosophical Storehouse': the life and afterlife of the Royal Society's Repository' (unpublished doctoral thesis, University of London, Queen Mary College, 2009), pp. 25-6.
[55] Royal Society Journal Book XI, pp. 14, 16. On the recovery of the Hooke Folio in 2006, see Robyn Adams and Lisa Jardine, 'The Return of the Hooke Folio', Notes and Records of the Royal Society 60 (2006) 235-239.

to proceed with some caution, since the compilation of the Posthumous Works was a piecemeal process, relying on the acquisition of papers from Hooke's relatives in two distinct bundles, and that further material came to Waller's hands in 1707, some two years after publication.) Waller opens the volume with Hooke's 'General Scheme, or Idea of the Present State of Natural Philosophy', a treatise developed from lectures he gave under the terms of Sir John Cutler's 1665 endowment of a lectureship on the history of trades and whose composition is customarily dated, following Patri Pugliese and Mary Hesse, to about the middle of 1668.[56] Consisting of Hooke's account of the history of natural philosophy, the flaws in the method followed by ancient philosophers, detailed instances of how to remedy them, and of the underlying cognitive structures which he insisted had to be taken into account when devising methods of experimental investigation, it is the fullest account he ever gave of his ideal of a natural philosopher. Waller's inclusion of it points not only to its potential utility but to how it can act as a guide to the understanding of Hooke's work; he remarks in an editorial note to the "General Scheme...of Natural Philosophy" that

> This Treatise of Dr. Hook's, tho' it was never brought to its designed Perfection, yet I thought best to present the Learned with in the first place, since it treats of the Method he proposed to himself in his Inquiries into Nature; and which he has very much observed.[57]

The 'General Scheme' also stakes Hooke's claim to the kind of independence of action enjoyed by the virtuosi, completing a transition in his career from employee of the Royal Society to speculative philosopher in his own right. It is not so much the specific argument of

[56] Mary B. Hesse, 'Hooke's Philosophical Algebra', Isis (1966) 57, p. 68, and Patri Pugliese, 'The Scientific Achievement of Robert Hooke: Method and Mechanics', unpublished doctoral dissertation, Harvard University, 1982, pp. 9-11.
[57] Robert Hooke, Posthumous Works sig. B1v.

the work as the fact of its being a methodological treatise that is of interest in this respect. Waller's organisation of material in the Posthumous Works develops Hooke's claim while trying, as much as possible, to remain faithful to Hooke's own preferred mode of publication. It consists mainly of series of lectures or papers on related subjects, loosely grouped together in the manner of Hooke's previous treatises on comets, microscopes, helioscopes, and lamps and water-poises. Waller's presentation of the material is full of admissions of its roughness and of its unreadiness for the press, yet his refusal to 'methodize [Hooke's work] anew' in preparing his edition draws attention to the extent to which it was already methodical – though it also acknowledges the limitations of reconstructing a work from occasionally fragmentary materials, as reflected in Waller's notes throughout the edition.[58] Waller has chosen the most ambitious of Hooke's courses of investigation to present here, even if most of them were never completed; the groupings – into lectures on light, the discourse of earthquakes, and the lectures on navigation and astronomy – are arranged so as to give at least the semblance of organisation to the scope and diversity of Hooke's research, and to give weight to Hooke's claim to be considered a serious and systematic investigator into nature. The two aspects of the volume Waller compiled, the uncollated chronological outlines of Hooke's activity in the biography and the thematically ordered lectures, discourses and experiments that form the bulk of the volume, bear some analogy to Hooke's own proposals for the Society's publishing strategy. These were to consist of a newsletter of recent activity would complement tracts of completed investigations into particular phenomena, practices, or aspects of nature.

Waller's combination of Hooke's life and works was designed to give back to the institution what he had latterly withheld from it. The identification of Hooke with the Society absorbed his work into the Society's archive and amplified the bare-bones accounts in its

[58] Waller, 'The Publisher to the Reader' in Hooke, Posthumous Works Sig. A2r.

journals at the same time as it used those journals, and the interests of the Fellows who had access to them and made up Waller's intended audience, to help give shape and credibility to Hooke's life and activity as an experimental philosopher. That defence of Hooke's right to the title, implicit in the nature and organisation of the material and explicit in Waller's claim that Hooke was in the very vanguard of the producers of new knowledge in the seventeenth century, was of course also a defence of the Society's experimental activity, which he had embodied virtually since its inception. One of the unfortunate side-effects of Steven Shapin's influential and very valuable thesis about the importance of genteel social codes in the creation of new knowledge in the period, and his focus on the figure of Robert Boyle as the cornerstone of that argument, has been the relegation of Hooke, and the others Shapin called 'invisible technicians', to the status of marginal figures in seventeenth-century culture if not in present-day historiography.[59] This account of Hooke's problematic social standing, in particular, has been challenged by Mordechai Feingold and Rhodri Lewis, and I suggest that Waller's strategy for presenting Hooke's works supports their case.[60]

In contrast to the institutional biographies produced by the French Académie Royale des Sciences, Waller's account of Hooke as printed was intended not as a memorial but as a functional account of a working life that would enable rapid cross-referencing with bodies of published and unpublished material to which the Fellows of the Royal Society enjoyed privileged access. Just at the moment that Waller attempted to reintegrate Hooke's lifetime of work with the Royal Society by reaffirming his identity as the arch-representative of its experimental philosophy, however, Newton rose to pre-eminence in reputation and to the

[59] For notable instances of these arguments, see Shapin, A Social History of Truth, and Stephen Pumfrey, 'Ideas above his station: a social study of Robert Hooke's curatorship of experiments', History of Science (1991) 29, 1-44.
[60] Feingold, 'Robert Hooke, Gentleman of Science', passim; Rhodri Lewis, 'Robert Hooke at 371', Perspectives on Science (2006) 14, pp. 558-573. See esp. pp. 561-2.

Presidency of the Royal Society, a role he filled in far more active fashion than any of his predecessors. Waller carefully suppressed any explicit challenge to the new President in his edition, which looks like no more than elementary tact. However, he also made a note on Hooke's manuscript diary, making it clear that he believed that there was a basis for such a challenge. He observed that 'Dr Hook […] was as I could prove were it a proper time the first Inventor or if you please first Hinter of those things about which Magni Nominis Heroes have contested for the Priority.'[61] That sentiment contrasts powerfully with the more dispassionate account that appears in print, and surely refers to the contests between Hooke and Newton. What Waller asserted as provable fact in the margin of the diary he stated more generally in the published 'life', as the motivation for Hooke's increasing unwillingness to publish his work as his life went on.

v) The 'Life' that might have been

The printed 'Life' does not tell the whole story, however. In the Hooke manuscripts in Trinity College library in Cambridge there is a document entitled 'A True state of the Case and Controversy between Sr Isaak Newton & Dr Robt Hooke as to the Priority of that Noble Hypothesis of Motion of ye Planets about ye sun as their Centre.'[62] The James catalogue of early manuscripts in the college library declares that Hooke is the author, an attribution that has been accepted without apparent demur by historians. The paper consists of four sides of manuscript notes from Hooke's work, published and unpublished, as well as his correspondence with Newton, laying out all those instances in which Hooke articulated, sometimes publicly, sometimes privately to Newton, his hypothesis of an inverse square relation between distance and attractive power; it also records some extracts from Newton's

[61] Hooke, Diary p. v.
[62] Trinity College Library, Manuscripts R.4.48 No. 4.

letters to Hooke of 1679/80. It is a collection of evidence, referring wherever possible to written sources, for Hooke's claim to priority in the discovery of the inverse square law.

None of the material involved is especially obscure (the first citation is from the Society's journals, referring to a paper that had been included in the Society's register books and of which a further copy now exists in the Society's Classified Papers). All of that material, as well as the "True State", has been extensively discussed, by scholars investigating the legitimacy of Hooke's priority claim.[63] However, I suggest that the nature of the document has not been properly understood because it has been incorrectly attributed, and that the author is not Hooke but Waller. Waller claimed to have proof of Hooke's priority, and the Trinity manuscript lays out exactly that case. Certainly it was not Hooke who gave the document its description, since it refers to Newton as 'Sir Isaak' and Newton was knighted in April 1705, fully two years after Hooke's death. The document consistently refers to Hooke in the third person, and the main text is in a regular italic hand, far neater and less angular than Hooke's usual writing, and resembles surviving samples of Waller's handwriting much more closely than it does Hooke's. Figures 1 to 4 show a side-by-side comparison of the same word in a Waller letter of 1707 and from the 'True State', with the documents set alongside one another for a larger view. Figures 5 and 6 shows a securely attributed example of Hooke's hand from the mid-1680s, where he has prepared a manuscript for the press (Royal Society Classified Papers XX f.62, on long telescopes) and thus, we might reasonably expect, paid some attention to neatness and legibility. Figures 7 and 8 compare the same word from this manuscript with

[63] See Royal Society, Cl.P/20/41 and RBO/3/35. For scholarly acceptance of the attribution of the paper to Hooke, see Alexandre Koyré, 'An Unpublished Letter of Robert Hooke to Isaac Newton', Isis (1952) 43, pp. 312-337, p.312, and Michael Nauenberg, 'Robert Hooke's Seminal Contribution to Orbital Dynamics', in Michael Cooper and Michael Hunter (eds.), Robert Hooke: Tercentennial Studies, pp. 3-33, 28-9.

the same word in Waller's 1707 letter. Figures 9 to 11 show other examples of individual words from securely attributed Waller letters matched to the same words in the 'True State'.

Some of the notes in the 'True State' correspond to annotations, also apparently in Waller's hand and referring to Hooke in the third person, on a letter from Newton of 28 November 1679. These are not reproduced in the published Newton Correspondence.[64] If my attribution is accurate, it means that Waller, at a time which we unfortunately cannot exactly determine but certainly after Hooke's death and perhaps before the publication of his Posthumous Works, actually prepared these materials for a vindication of Hooke against Newton. He did so in a method analogous to that used in his accounts of other controversies in the 'Life', into which he may have intended to insert it. The genesis of the Posthumous Works is too complex to allow for a settled interpretation. We know that Waller did not receive Hooke's papers in one go, and we do not know at what point he began writing the 'Life'. The fact that a proof-reading error passed into print gives us a possible date – Newton is referred to by his knighthood in the dedication but as 'Mr. Newton' in the text of the biography, suggesting that the text was composed before Newton was knighted.[65] Furthermore, it is certain that some part of Hooke's papers passed into Waller's hands before Newton's election as president of the Society, which took place at the anniversary meeting eight months after Hooke's death. Waller's tantalising note that he could vindicate Hooke's priority claims is dated after 1708;

[64] 'Hookes Hypotheses here hinted at', 'his aversion to Philosoph. Studys &c', 'here pretends he knew not Hs Hypothesis', converted into a note in the 'True State' that reads 'In answer to this Newton pretends he knew not Hookes Hypoth. as by his answer to ye former [Hooke's letter of November 24th] Dated Nov. 28 1679 and in ye same letter says his affection to Philos. Studys quite worn out. For Newton's letter in autograph with annotations, see Trinity College Library Manuscripts Ms.R.4.48.1; for the version in the published correspondence, see H.W. Turnbull Newton Correspondence, vol. 2 (1676-1687), pp. 297-303. It is perhaps also worth mentioning at this point that Geoffrey Keynes does not include the 'True State' in his A Bibliography of Robert Hooke, Oxford: Oxford University Press, 1966 – though he does include the surrounding material from the Trinity manuscripts (p. 84)

[65] Waller, 'Life' p. xv, in the context of the exchanges between Hooke and Newton over the theory of light and colours 'which being now so generally known, I shall not farther insist on.'

and we can determine that some fresh papers of Hooke's came to Waller's hands in or about 1707, from a letter he wrote to Hans Sloane.[66]

vi) Conclusion

The evidence that Waller drew up the 'True State' provides a fascinating glimpse into the 'Life of Hooke' that he might have written. He put aside the defence of his friend but did not neglect the possibility of returning to it later. The note he left on the manuscript diary becomes a reminder to himself, or perhaps a hint to whoever would inherit the papers from him, that Hooke's claim to a share in the credit of the discovery of the inverse square that had accrued to Newton could be asserted at a more opportune moment. The problem of Hooke's life, which Hooke had perceived as the Royal Society's practices of registration, Waller frames as the solution in the written 'Life', and reintegrates Hooke's experimental pursuits with the institutional framework from which he had dissented. In responding to the peculiar shape of Hooke's life Waller created the first English biography of a natural philosopher to celebrate his subject's achievement principally as a natural philosopher. The organisation of the Posthumous Works endeavours to assemble Hooke's varied and fragmentary scientific investigations into more coherent wholes, while the 'life' links up with the Society's own registers to enable the reader to navigate them. Waller created the first scientific biography not to inaugurate a tradition or invent a genre, but to make Hooke's life useful to his former colleagues; he employed quite stringent standards of written, documentary evidence for his account in order to integrate it more efficiently with an existing documentary resource, namely the archives of the Royal Society.

I have argued that Waller's fashioning of Hooke was a way of shaping a peg to fit a hole. Perhaps in order to avoid vitiating his own efforts by courting controversy after Hooke's

[66] Royal Society EL/W3 f.70, Waller to Sloane 5 October 1707.

death, he contemplated but suppressed the best evidence he could find concerning Hooke's clashes with Newton. The highly specific strategy adopted by Waller, for which he needed the good will of the Royal Society in order to effect his restoration of Hooke's life and work, would hardly survive a fresh assertion of Hooke's claim with Newton as President. If the 'True State' was composed before the 'Life' was published, its omission becomes part of that strategy, and the airbrushing of the disputes out of the 'Life' a matter of necessity. Ironically, Waller's attempt to remain above the fray did not survive the explosion of scientific biography that followed the death of Newton. From the mid eighteenth century, the hagiographic tradition in Newton biography actually swallowed up Hooke's biography, consistently expropriating sections of Waller's careful restoration of Hooke's life and work in order to cast Hooke into the shadows.[67]

[67] This tradition in Newton biography held unchallenged sway until the nineteenth century; for a discussion of this, and the changing historiography of early modern science at that time, see Rebekah Higgitt, Recreating Newton: Biographies of Newton and the Making of Nineteenth-Century History of Science. London: Pickering & Chatto, 2007.

Figures:

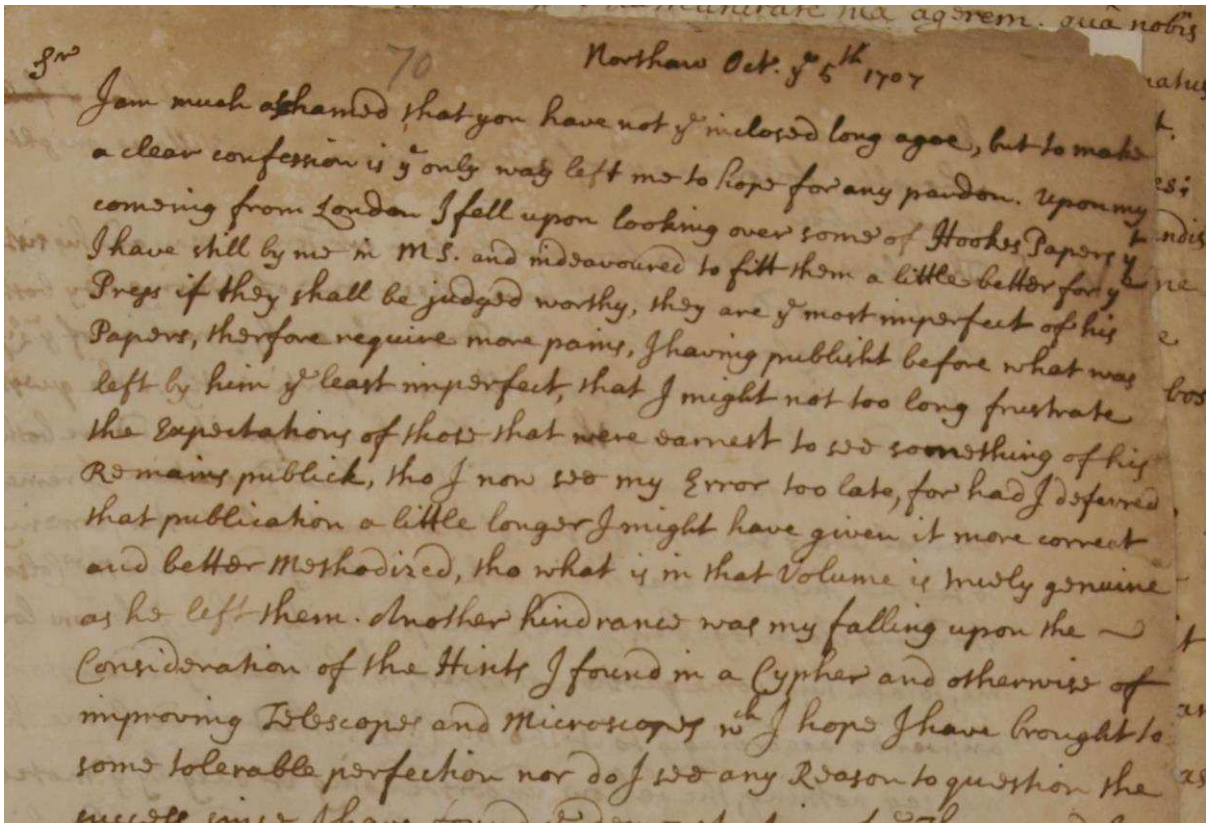


Figure 1 – Holograph letter from Waller to Hans Sloane, Royal Society Early Letters W3/70, 4 October 1707.

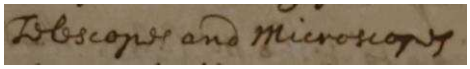


Figure 2 – Detail of the word ‘Telescope’ from RS EL/W3/70.

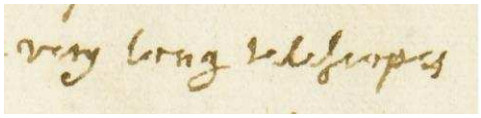
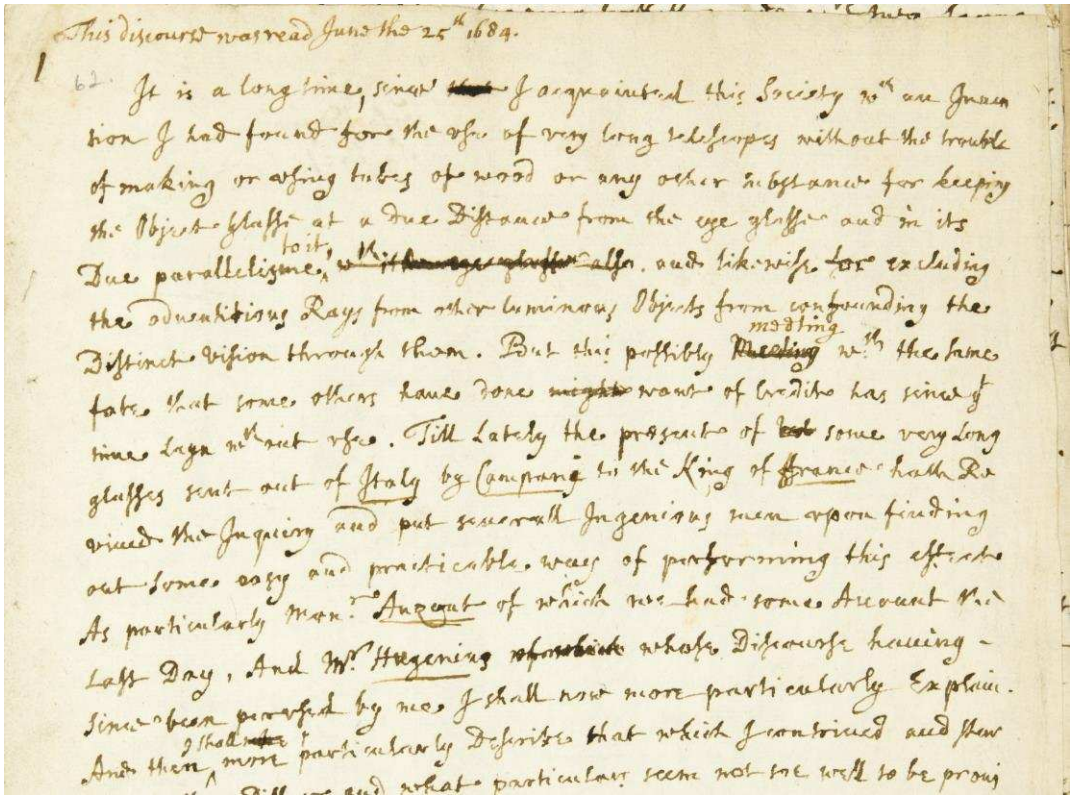


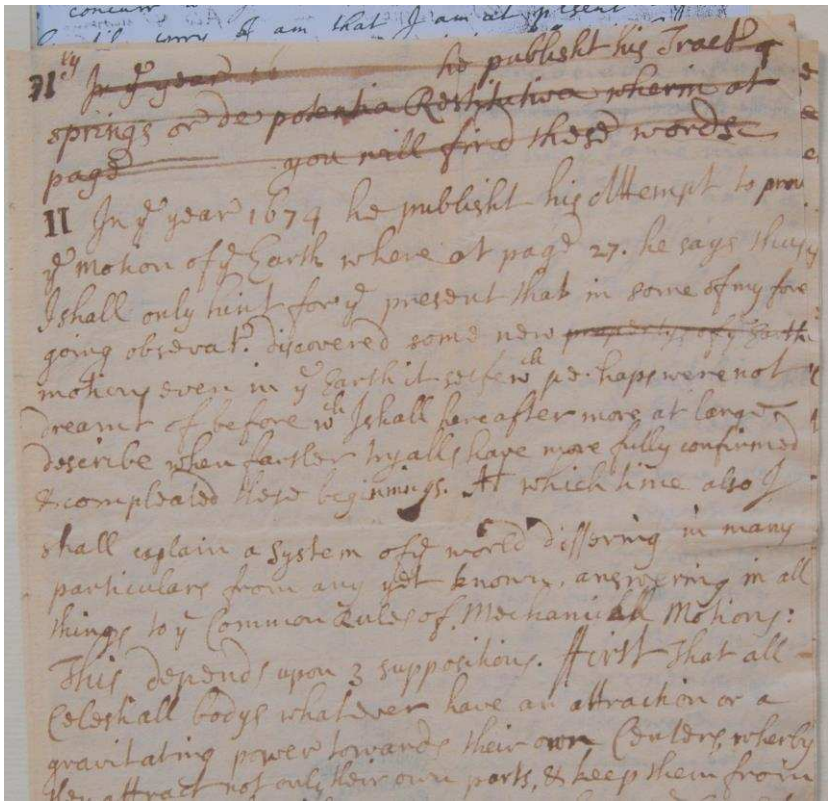
Figure 3 – Detail of the word ‘telescope’ from RS Cl.P./20/62 (figure 4, below). Figures 1-4 make plain the general and some of the specific differences between securely attributed examples of Waller’s hand and Hooke’s.



This discourse was read June the 25th 1684.

62. It is a long time, since I first acquainted this Society with an Invention I had found for the use of very long Telescopes without the trouble of making or using tubes of wood or any other substance for keeping the Object glasse at a due Distance from the eye glasse and in its Due parallelisme, which I call the eye glasse also, and likewise for excluding the adventitious Rays from other luminous Objects from confounding the Distinct vision through them. But this perhaps meeting with the same fate that some others have done might want of credite has since of times lain neglected. Till lately the present of some very long glasses sent out of Italy by Campani to the King of France hath Revived the Inquiry and put several Ingenious men upon finding out some easy and practicable ways of performing this effect. As particularly Mr. Auzout of which we had some Account this Last Day, And Mr. Hugenius whose Discourse hearing since been perused by me, I shall now more particularly Explain. And then I shall more particularly Describe that which I contrived and shew and what particulars seem not yet well to be provi

Figure 4 – Robert Hooke holograph manuscript ‘Of Long Telescopes’, 5 June 1684, RS Cl.P./20/62. The word ‘telescope’ occurs in the second line.



11 In y^e year 1674 he publisht his Attempt to prove y^e Motion of y^e Earth where at pag^d 27. he says thus I shall only hint for y^e present that in some of my foregoing observat. discovered some new [illegible] of the Moon even in y^e Earth it self which I have not yet observed before which I shall hereafter more at large describe when I shall have more fully confirmed & compleated those beginnings. At which time also I shall explain a System of the world differing in many particulars from any yet known, answering in all things to y^e Common Rules of Mechanical Motions: This depends upon 3 suppositions. First that all Celestial bodys whatever have an attraction or a gravitating power towards their own Centers, whereby they attract not only their own parts, & keep them from

Figure 5.1

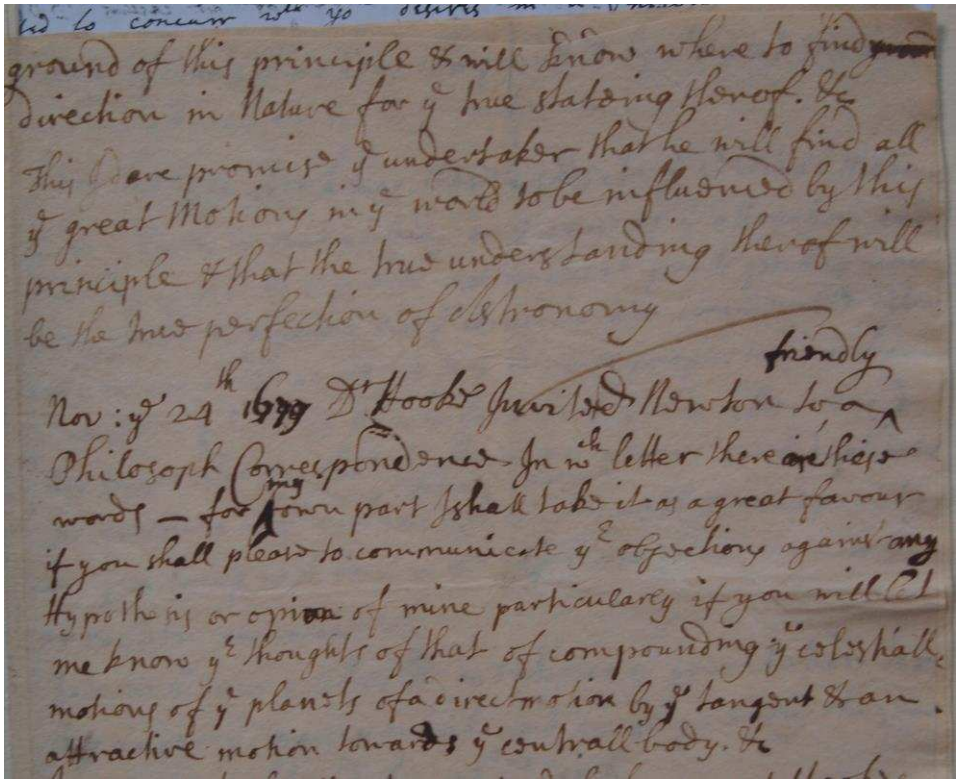


Figure 5.2 (and 5.1, above): Trinity College MS R.4.48 – the 'True State' Manuscript, whose authorship has traditionally been attributed to Hooke and which I here attribute to Waller. The word 'published' occurs on the very top line of figure 5.1 (partially struck out), and the word 'Correspondence' at the eighth line of figure 5.2

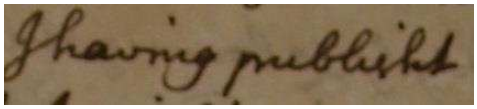


Figure 6.1 Detail of the word 'publisht' from 'True State' Manuscript.

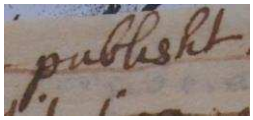


Figure 6.2 Detail of the word 'publisht' from Waller to Sloane, RS EL/W3/70.

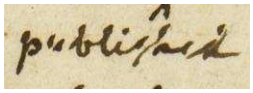


Figure 6.3 Detail of the word 'published' from Hooke, RS Cl.P/20/59.

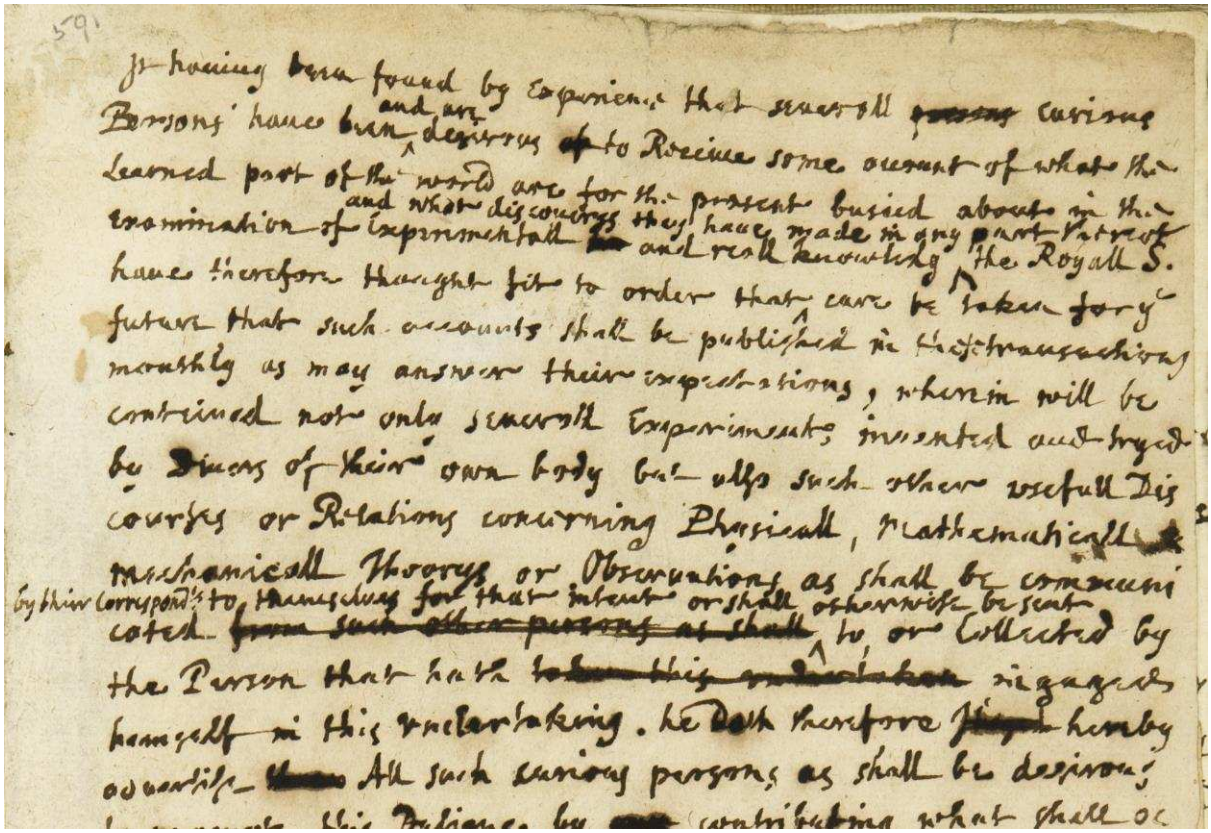


Figure 6.4 Holograph note by Robert Hooke on plans to resume publication of the *Philosophical Transactions* of the Royal Society, RS Cl.P/20/59 (no date). The word 'published' occurs on the sixth line. Figures 6.2 and 6.3 show the same word from two securely attributed manuscripts by Waller and Hooke respectively, and 6.1 the same word from the document whose attribution is disputed here. Note in particular the elongated 's' in Hooke's hand, and the lack of defined loops in Hooke's 'b', 'l' and 'h', and the similarities between those features in the Trinity manuscript and the Waller letter. In general, Hooke's hand is much more angular and tremulous than either Waller's or the Trinity author's.

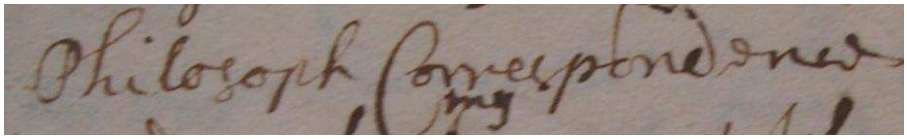


Figure 7.1 Detail of the words ‘Philosoph. Correspondence’ from ‘True State’ Manuscript.

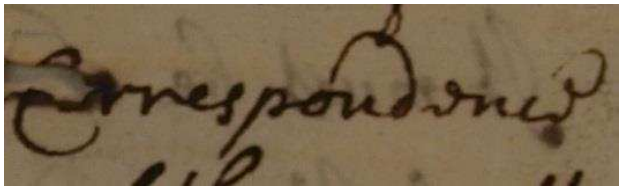
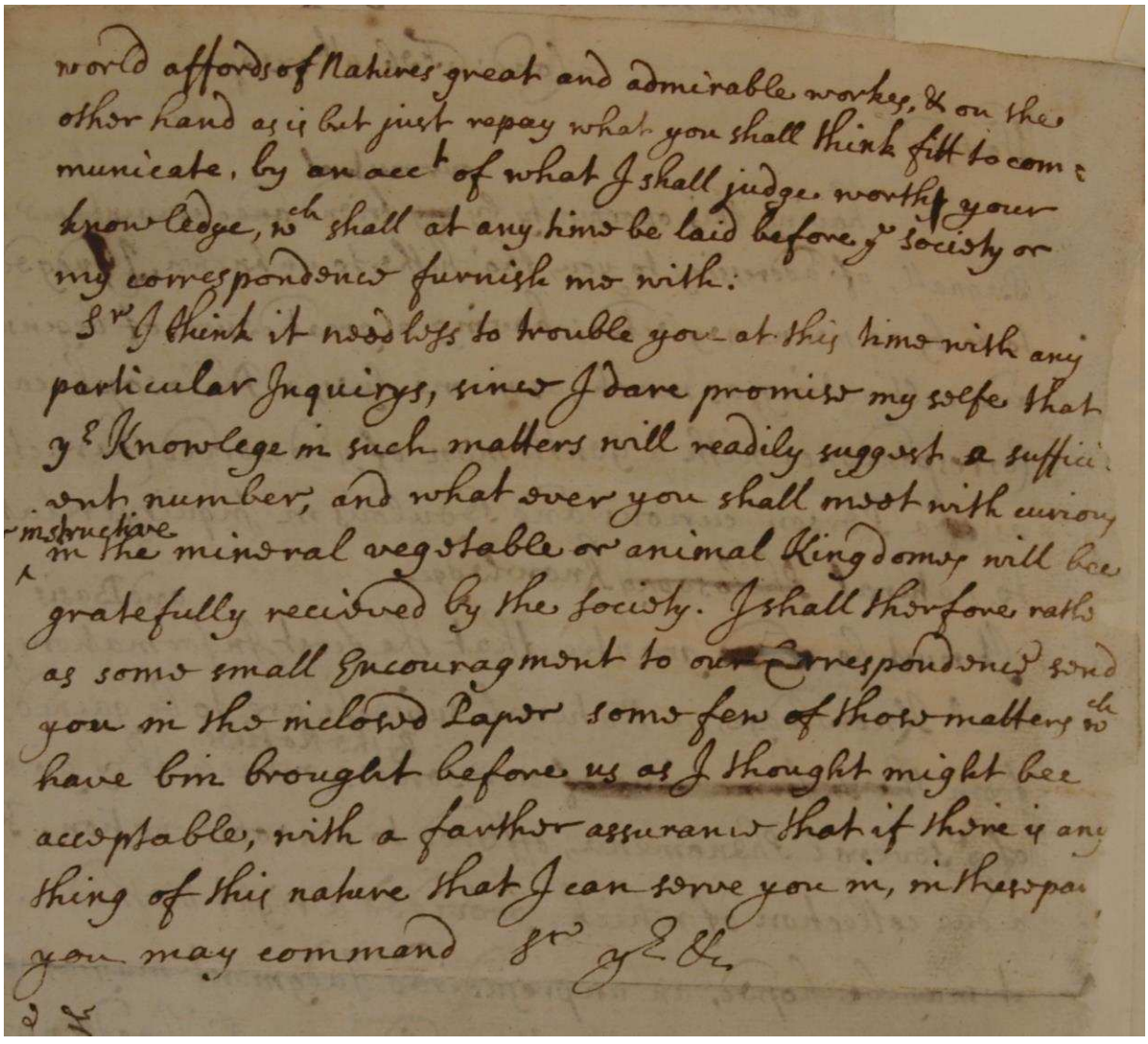


Figure 7.2 Detail of the word ‘Correspondence’ from Waller to Dr Hoye, RS EL/W3/78.



world affords of Natures great and admirable workes, & on the other hand as it but just repay what you shall think fitt to communicate, by an acct of what I shall judge worthy your knowledge, wch shall at any time be laid before ye society or my correspondence furnish me with:

Sr I think it needless to trouble you at this time with any particular Inquirys, since I dare promise my selfe that yr Knowlege in such matters will readily suggest a sufficient number, and what ever you shall meet with curious in the mineral vegetable or animal Kingdomes will bee gratefully received by the Society. I shall therfore rather as some small Encouragment to our Correspondence send you in the inclosed Paper some few of those matters wch have bin brought before us as I thought might bee acceptable, with a farther assurance that if there is any thing of this nature that I can serve you in, in these parts you may command Sr yr &c

Figure 7.3 – Letter from Waller to Dr Hoye in Jamaica, RS EL/W3/78, 4 February 1714. The word ‘Correspondence’ occurs on the sixth line from the bottom.

Figure 7 is adduced here as further evidence of the strong similarities between the hands of the ‘True State’ author, claimed here as Waller, and another Letter in Waller’s own hand. The overall similarity is very strong, and the formation of the letters ‘ence’ at the end of each virtually identical.